"AUTOMATIC" AND INTELLIGENT ACTIVITIES.[1]

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Since the discovery of the fact that a correspondence of some nature exists between the activities of nerve and modifications of consciousness, the zoologist has taught the psychologist many things of great value. In my view modern psychology in turn has not a few lessons to teach the zoologist, and what I have to say in this paper points to one such lesson from this source.

It is evident from current discussion that the zoologist today asks one question which is of great interest also to the psychologist: viz., whether we are warranted in assuming that there is a difference in kind between certain forms of animal activity, in consideration of the fact that intelligence guides some and does not guide others:—whether we have a right to assume that under certain mysterious conditions an effective consciousness steps in to influence animal behavior.

Strictly speaking, this is a metaphysical question: but there is no possible objection to its consideration by the zoologist if he faces the fact that in such consideration he leaves the realm of zoology proper.

This question is answered affirmatively, either explicitly or tacitly, by a large number of our modern biologists, although it is evident that they usually take this position without due consideration.

We commonly overlook the fact that we assume the existence of consciousness in animals only as the result of an interpretation of their acts in terms of our own experience. Upon the appearance in animals of certain activities resembling our own, we argue by analogy, and as the result assume in the animals conscious experiences similar to our own. I do not myself question our right to make use of this argument by analogy; in fact I would contend not only that we may use it, but that we are bound to carry the argument much farther than we commonly do.

But the zoologist usually fails to note that he is treading on dangerous logical ground when he uses the consciousness as thus assumed to explain the nature of certain activities, which activities alone give him ground for his assumption of the existence of the very consciousness to which he appeals as a basis of explanation.

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[1] An address delivered before the Zoological Seminar at Columbia University, April 21, 1904.

But some one is likely to say that we attempt to make this distinction among the activities of animals just because we find in our experience certain cases in which our activities do not seem to be influenced by consciousness, while in other cases consciousness does seem to be efficient in relation to them. This is of course true: but the meaning of the "efficiency" thus ascribed to consciousness, if investigated, is found to be such that its use in this way is of doubtful validity: a point to which I cannot here refer.

In any event it must be apparent to all that this attempt to treat consciousness as an efficient cause in the explanation of animal behavior in certain cases, and in certain cases only, results in an enormous amount of inconsistency in descriptive work, and in very wide differences of interpretation. These inconsistencies and differences of interpretation would disappear, however, at once if it could be shown that what I call the neururgic[2] and noetic correspondence is thoroughgoing: i.e., that all nervous activities correspond with psychic modifications of some form, and vice versa. For if this were true we would come to look upon all animal life as involving some forms of consciousness; we would find everywhere the efficiency of consciousness;—whatever this efficiency may mean; and we would then find no ground for sharp distinctions between intelligent and automatic acts.

Now it is exactly this thesis that I am concerned to defend. It of course cannot be claimed that this is a new thesis, for many eminent men in the past have suggested it, and in particular directions have carried the favorable argument pretty far; but it appears to me that the evidence before us today, which is in the main given to us by the effective investigations of the zoologists, leads us to a restatement of the thesis in a form which is thoroughly convincing.

Some one will perhaps at once object:—"But all high authorities among the neurologists and psychologists agree that the activities in the cortex of the brain are alone concerned in correspondence with consciousness;" or with Loeb you may say, that a certain specific structure, which gives the animal what he calls "associative memory," is demanded before consciousness ever appears.

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[2] I have used this word in my late writings, for convenience, with the meaning "relating to the activity of nerve"; there being no current term having this exact significance.

I agree that one takes his courage in both hands, as the French say, in opposng this widely current view: but I find it so simple to state the observed facts in conformity with the thesis I defend that this apparent opposition to the currently accepted view turns out to be little more than a verbal one; and the new expression of the facts seems to me to be of great importance to both the zoologist and the psychologist.

My hope and belief is that the zoologist will eventually adopt this view which I uphold, and that the psychologist will thus be forced to treat the corresponding psychological view with full attention.

The modern zoologist has compelled us to look upon the nervous system of animals as active in the determination of their movements. It is interesting then to note that quite independently the modern psychologist has compelled us to throw over the atomistic psychology, which was current previous to our generation, and asks us now to look upon consciousness as *systemic.* Here is a correspondence which is fully accepted on both sides.

But the zoologist has gone beyond this and has shown us that the nervous system of the higher animals is a vastly complex system of minor nervous systems, of hypothetical nervous elements: minor nervous systems, the elements of which are variously related and differently integrated, but which as minor systems are themselves related and integrated to form the nervous system as a whole.

This being so it is exceedingly interesting to note that introspection shows us that human consciousness is also a vastly complex system of minor psychic systems of what may be hypothetical psychic elements: minor psychic systems, the elements of which are variously related and integrated, but which as minor systems are themselves related and integrated to form what we call consciousness as a whole.

For example we have the great minor psychic systems —

Sensations, relating to receptivity; Instinct Feelings, relating to reaction of the whole organism; and the realm of Ideas, of Thought, relating to the co-ordination of the two other realms.

But within these minor systems, of what we may call the first class, we find less general systemic differentiations. For example, light, and sound, and heat, and taste, and touch, are separate minor psychic systems within what for convenience we may call the higher minor psychic system—Sensation. And within these lower minor psychic sensational systems, light, sound, etc., we have an indefinitely large number of still lower minor psychic systems, e.g., an indefinite number of colors, an indefinite number of tones, etc.

The colors are clearly differentiated and yet are all held together systemically; and so are the several sound tones. No one ever thinks that a special color is a sound tone of any kind.

And so the sensations as a whole on broader lines are clearly differentiated, and yet held together systemically. No one ever mistakes a sensation for an idea, or an instinct feeling.

Were there time this same fact could without difficulty be shown in relation to the other minor systems of the first order, viz., instinct feelings and thoughts.

Here then we have apparently a far-reaching correspondence between the neururgic and noetic systemic relations. And I submit, that had we learned this lesson, taught us by the modern zoologist and psychologist, before we had been taught that the cortex of the brain is the organ of mind, it never would have occurred to us to consider this latter dogma as in any degree tenable.

We would have been led of course to hold that the cortex of the brain is, from a certain point of view, the pre-eminently important part of the nervous system, but we would have conceived the relation of consciousness to nervous activities after the manner which I shall now briefly indicate.

If we consider the nervous system as a whole, and assume that its elements are spread out evenly on a flat plane, instead of being to a large extent crowded within the skull; then if we divide any flat surface up into little squares we may suppose each little square to represent a nervous element. We may also represent the degree of the activity of each element by assuming its corresponding square raised by a certain amount above this plane.

Now as I understand it, we have to assume that each nervous element is active in some measure so long as it lives; and if that is true then what we speak of as a special activity in any nervous part is really but an *emphasis* of activity in that part.

But the amount of activity in the several nervous parts varies greatly at any moment taken for consideration: so that if the whole nervous system is thus viewed we may very well symbolize its neururgic condition at any moment, in spatial terms, by representing it as the surface of a liquid upon which a wave pattern appears.

In other words the nervous system as a whole will display in each moment what I call a specific "neururgic pattern," in which certain parts are more markedly active than others. The markedly active parts are not the only active parts; but their activities are set over in contrast from the great body of less markedly active parts, which form an undifferentiable mass of minor activities against which the specially marked activities appear as emphases of activity.

Now if the theory of neururgic and psychic, or noetic, correspondences is true; and if it is thoroughgoing; then consciousness at each moment must display a specific "noetic pattern" in which certain parts are more emphatic than others. The markedly active psychic parts under such a view are not the whole of the consciousness of the moment, but in consequence of their emphasis they are set over in contrast from the great body of less emphatic psychic parts which form an undifferentiable psychic mass against which appear the special *psychic emphases.*

The question now arises whether we have any ground in experience for believing that such a correspondence exists.

In the first place we have an overwhelming amount of evidence to show, what is generally agreed to by the neurologist and psychologist alike, that the psychic states which are in the field of attention,—our sensations, instinct feelings, ideas, etc.,—do correspond with the emphases of activity in the neururgic pattern.

The question then remains whether there exists an undifferentiable noetic mass against which these noetic emphases are contrasted, corresponding with the neururgic mass against which the neururgic emphases are contrasted.

Of the existence of this noetic mass I think there can be no question. The field of attention spreads out from a clear focus to a margin, and this margin fades away into what Prof. Wm. James call the "fringes." And even if we take the most punctual of simple sensations we certainly cannot claim that it exhausts consciousness: there is always felt to be a something more of consciousness of the moment when the sensation appears: and its appearance does not involve the annihilation of this rest of consciousness. This becomes still clearer in the fact that we have come to speak of these clear elements of attention as presentations. Presentations to something they must be; and under this view, that to which they are presented is the undifferentiable mass of unemphatic psychic parts which constitutes what I think may well be called the *field of inattention.*

And now we may turn again to the zoologists' problem. If our thesis is valid all activities of parts of the body which are connected together in a system have psychic correspondents which are either emphatic enough to become separated in attention, or are part of the undifferentiable psychic mass which makes up the field of inattention.

The so-called reflex or "automatic" acts are thus acts whose psychic correspondents are within the field of inattention. The intelligent acts are acts whose psychic correspondents are clearly within the field of attention.

The frequently recurrent iris reflex acts, for instance, are so fixed and definite that they never appear as emphatic, and their psychic correspondents never get into the field of attention.

And this view enables us to explain certain puzzling cases where what we call reflex acts sometimes do, and sometimes do not, involve noticeable modifications of consciousness.

The heart beat, for instance, is of the reflex type, and usually during active waking life there is no noticeable conscious correspondent of its activities. In this case, under our view, the psychic correspondents of the heart activities, while we are wide awake, are of the field of inattention; as related to the marked emphases of this active waking life. But as we fall asleep the heart beat activities become relatively emphatic, and then we are likely to find their relatively emphatic psychic correspondents within the field of attention.

There is thus no ground of distinction between the two types of action except one of neururgic, and the corresponding noetic, emphasis.

Let us now turn briefly to a theory which I have defended at length in my *Instinct and Reason,* and which I think accords with, and in some measure explains, the facts, and which goes far to corroborate the general thesis which I have here maintained.

If we could isolate a living cell we must assume that it would react in a definite way to appropriate stimuli; and its reaction we may, if we choose, call its "instinct action."

Now if a number of such cells, for simplicity let us say 5, are brought into relation as a little organism; and if each of the cells retains its specific modes of instinct action; then, if we consider the group rather than its elements, the combined instinct actions of the elements would give what would appear as a specific instinct action of the whole group, or little organism. In fact it is clear that an organism such as we are considering could not persist, as such, unless the combination of the instinct actions of the elements resulted in an instinct action of the group which would enable the group to conform with the conditions of its environment.

The normal instinct actions of the five elements would together constitute the normal instinct action of the group. But if the instinct action of one of the five elements should be, not changed in character, but merely markedly emphasized, then the normal instinct action of the group would be *modified*. Emphasis of activity in the element would thus appear to be the basis of modification of the instinct action of the group taken as a unit.

If now we suppose that for each of these five elements is substituted a little system of five elements: then we would have a system of five minor systems of five elements each. Each of these five minor systems would display its own group instinct actions; and the instinct actions of all the five minor systems would give us what we would call the normal instinct action of the whole system of five minor systems.

Now here again; if the instinct action of a special minor system within the group of five, were not changed in character, but merely became emphatic, the typical instinct action of the group taken as a whole would appear to be *modified.* And even if the instinct action of only one element in one minor system were emphasized, its little minor system's typical instinct action would be modified, and thus also we should have a modification of the typical instinct action of the whole large organism. It would thus appear that modification of the normal instinct actions of such a simple organism of 25 elements could all be traced back to mere emphasis of activity in some of the minor systems, or in the elementary parts themselves.

Now if this is the process of modification in such simple organisms as the one I have pictured, it is easy to see how complex might be the modifications of the typical instinct actions of an enormously complex system of minor systems such as the human nervous system is; and nevertheless it might well be that these variations of mode of instinct action of the organism as a whole might be all of them traceable back to mere emphases of the instinct actions in some of the minor nervous systems, or even farther back still to a mere emphasis of the instinct action in some element of a minor nervous system.

Emphases of activity in minor parts would thus appear to be the basis of modification of instinct actions of the organism as a whole.

But now let us ask how these emphases of activity within systems might be brought about.

1. In the first place, in all organisms, from the simplest to the most complex, they would certainly be in great part determined by the energy of stimuli reaching the parts of the system from the environment of the whole system.

But when the organism is very complex emphases within minor systems might be due to influences quite within the whole system; appearing in parts of that system which are environmental, as it were, in relation to the minor system whose activity is emphasized when modification occurs.

(2-A) But these influences within the complex system which thus produce emphases of activity in one of its minor systems, may themselves be emphatic activities in other minor systems; or (2-B) on the contrary they may arise out of the great undifferentiable mass of unemphatic activities against which the emphases of activity are contrasted.

In this manner it appears that we are able to say that all the activities observed in animals are instinct actions; that they all appear as modes of that simplest of all forms of activity, viz.: the reaction of a living cell to the stimulus received from its environment. Beyond this we may hold that these instinct actions vary because of the variations of the instinct actions of the minor systems of which the great system is composed, these particular variations being in all cases traceable to mere emphases of activity in certain of these minor systems, or in the elements of which these minor systems are composed.

Assuming that all this is true we must note that we have thus far dealt only with objective facts. But if now we go back to the propositions with which we began, we recall that, under the hypothesis of a thoroughgoing neururgic and noetic correspondence already maintained, these emphases of nervous activity, which appear to be of the very essence of variations in the forms of activity of the organism considered, necessarily correspond with emphases within consciousness which make up what we call the field of attention.

If our objective view then is a valid one we should expect to be able to trace within consciousness the same relations which we have thought out in this objective study of animal activities. That is we should expect to note in experience that the most marked variations from our typical activities are accompanied by emphases within consciousness—in what is commonly called the field of attention: and this is of course a matter of every day experience.

But beyond this we should expect to find (1) the most marked form of these variations, as thus connected with states of attention, distinctly related to the reception of environmental stimuli. That this is true is clear in the fact that a large part of our attentive consciousness consists of the noting of objects in the outer world, while at the same time the actions of our bodies are concerned with adjustments bearing relations to these objects.

But beyond this, as we have seen that the emphases of instinct actions in minor nervous systems, to which modifications of activity are due, may be the result of influences arising within the whole nervous system, and (2-A) as the result of specially emphatic activities already existing within the system; so we should expect to find the emphases within consciousness accompanying modifications of instinct action often due to emphatic influences within the conscious system itself; and this we surely find in the stream of thought which runs parallel with a large proportion of those variations of activity which we observe in ourselves. In this stream each emphasis in attention seems to be influential in producing its successor.

But finally (2-B), as we have seen that neururgic emphases, to which variations of activity are due, may be the result of influences arising out of the great undifferentiable mass of unemphatic activities against which the emphases of activity are contrasted: so we should expect to find the emphases within consciousness, which accompany variations of activity, determined often by influences which are felt to arise out of the undifferentiable psychic mass of unemphatic psychic states: i.e., we should expect to find the field of attention at such times determined by obscure influences from the field of inattention. And this we surely do find in what is called voluntary attention; i.e., in attention which is maintained as such by the reaction of the whole system of consciousness. And in this as all psychologists acknowledge nowadays, we have the root of that modification of our reactions upon the outer world which we describe as due to volition.

And now we may turn again to the problem with which we began; for if what has just been said is true we should find in experience exactly what we do find: viz., on the one hand that activities which do not involve distinguishable modifications of instinct action will have psychic correspondents of so unemphatic a form that, for the most part, they will belong to the field of inattention and not to the field of attention: they will be what the common man quite improperly calls "unconscious."

And on the other hand, we should find that activities which do involve distinguishable modifications of instinct action will have emphatic psychic correspondents which will therefore be in the field of attention; and these activities will appear as what are known as "intelligent" activities.

On the physical side then we have instinct actions, fundamentally of one type, running through all minor and major nervous systems, and producing instinct actions of the whole organism. When these instinct actions of the organism are normal they are known as typical. But when some minor instinct action becomes emphatic, then the total instinct action of the organism is modified, and we have what we call the phenomenon of variation.

On the psychic side correspondingly we have what we may call instinct feelings, fundamentally of one type, running through all minor and major psychic systems, and producing what we may still call instinct feelings within the whole of consciousness. But when some minor instinct feeling becomes emphatic, then the total instinct feeling within consciousness is modified, and corresponding with physiological variation we have the phenomenon of intelligence.